

**(Part-I)****2. Write short answers to any Five (5) questions: (10)****(i) Define the refraction of wave.****Ans** The change of path of waves while passing from one medium into another medium, a part of it returns back in the same medium is called refraction of waves.**(ii) What is meant by compression?****Ans** A series of disturbances in the form of waves will start moving along the length of the slinky spring. Such a wave consists of regions called compressions.**(iii) Define mechanical waves and write name of its types.****Ans** Waves which require any medium for their propagation are called mechanical waves.

Its types are:

1. Longitudinal Waves
2. Transverse Waves

**(iv) Differentiate between noise and musical sound.****Ans** **Musical Sounds**

"The sounds having pleasant effect on our ears are called musical sounds."

**Examples:**

Sounds of musical instruments such as flute, violin, drum, etc.

**Noise**

"The sounds which create jarring effect on our ears are called noise."

**Examples:**

Sound of traffic, sounds of machinery, etc.



**(v) What is silent whistle? Write its frequency limits.**

**Ans** A silent whistle is a type of whistle that emits sound in the ultrasonic range which people cannot hear but some other animals can include dogs and domestic cats and is used in their training. Its frequency limit is 20 KHz to 25 KHz.

**(vi) Define Right Hand rule.**

**Ans** Grasp a length of wire with your right hand such that your thumb point in the direction of the current. Then fingers of your right hand circling the wire will point in the direction of the magnetic field.

**(vii) Can a transformer work on direct current?**

**Ans** A transformer cannot operate on direct current because direct current gives constant magnetic flux. According to Faraday's law, induced emf produces only when there is the change of magnetic flux.

**(viii) Define electromagnetic induction.**

**Ans** The production of an electric current across a conductor moving through a magnetic field is called electromagnetic induction.

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**3. Write short answers to any Five (5) questions: (10)**

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**(i) Define refractive index.**

**Ans** "The refractive index of a medium is ratio of speed of light in a vacuum to speed of light in the medium."

**(ii) Write the types of endoscope.**

**Ans** Cystoscope and gastroscope are the types of endoscope. As an endoscope is a medical instrument used for exploratory diagnostics, and surgical purposes. Cystoscope is used to examine the bladder and the gastroscope is for stomach.



**WPS**  
(iii) **Differentiate between pole and optical centre.**

**Ans** The mid-point of the aperture of the spherical mirror is known as pole, while a point on the principal axis at the centre of a lens is called optical centre.

(iv) **Name at least four browsers being used nowadays.**

**Ans** The most popular browsers on the market today include:

1. Internet Explorer
2. Opera
3. Mozilla Firefox
4. Google Chrome

(v) **Define word processing.**

**Ans** Word processing is such a use of computer through which we can write a letter, prepare reports and books. By means of this, we can develop any document and see it on screen after typing.

(vi) **Write the storage capacity of Compact Disc (CD) and DVD.**

**Ans** A CD can store over 680 megabyte of computer data. A DVD is the same size as traditional CD, is able to store up to 17 gigabytes of data.

(vii) **What do you mean by nuclear transmutation?**

**Ans** The spontaneous process in which a parent unstable nuclide changes into a more stable daughter nuclide with the emission of radiations is called nuclear transmutation.

(viii) **Write the difference between fission reaction and fusion reaction.**

**Ans** The reaction in which a heavy nucleus, such as U-235 splits into two smaller nuclei by absorbing a slow moving (low-energy) neutrons, then it is called fission reaction.

When two light nuclei combine to form a heavier nucleus, the process is called nuclear fusion.



**4. Write short answers to any Five (5) questions: (10)**

**(i) How does electrostatic induction differ from charging by friction?**

**Ans** In case of electrostatic induction, the body is not physically in contact with other body to be charged. The charged body is brought near to the body to be charged. But in case of friction, the surface of the two bodies are rubbed with each other. So there is mutual transfer of electrons.

**(ii) Write any two uses of capacitor.**

**Ans** Following are two uses of capacitor:

1. They are used for tuning transmitters, receivers and transistor radios.
2. They are used to distinguish between high and low frequency signals.

**(iii) Define S.I unit of capacitance.**

**Ans** "If one coulomb of charge given to the plates of a capacitor produces a potential difference of one volt between the plates of the capacitor, then its capacitance would be one Farad."

S.I unit of capacitance is Farad (F).

**(iv) What is the difference between conductors and insulators?**

**Ans** The device which is good conductor of electricity is called conductor. On the other hand, the device which is a bad conductor of electricity is called insulator.

**(v) Differentiate between Ohmic and Non-Ohmic materials.**

**Ans** Materials that obey's Ohm's law, and hence a constant resistance over a wide range of voltages, are said to be ohmic. Materials having resistances that changes with voltage or current are non-ohmic.



(vi) How many watt-hours are in 1000 joules?

**Ans** As we know,  
1 watt-hour = 3600 joules  
As 1 hour = 3600 sec  
So,  $E = \frac{1000}{3600}$   
= 0.28 watt-hour

(vii) Describe the uses of cathode ray oscilloscope.

**Ans** Cathode-ray oscilloscopes are used:

1. Displaying waveforms.
2. Range-finding (as in radar).
3. To find the depth of seabed (Echo-sounding).
4. It also used to display heartbeats.

(viii) Write the truth table of NAND Gate.

**Ans** Truth table:

The truth table of NAND Gate is given below:

A	B	$X = \overline{A.B}$
0	0	1
1	0	1
0	1	1
1	1	0

(Part-II)

**NOTE:** Attempt any TWO (2) questions.

**Q.5.(a) Explain the refraction through convex lens by making ray diagram. (4)**

**Ans** In mirrors, images are formed through reflection, but lenses form images through refraction. This is explained with the help of ray diagrams as followed:

Image formation in convex lens can be explained with the help of three principal rays shown in the following Fig.



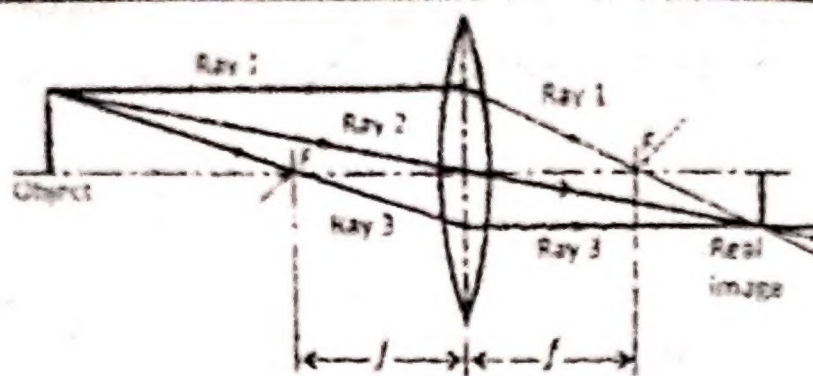


Fig. Convex Lens.

### Explanation:

1. The ray parallel to the principal axis passes through the focal point after refraction by the lens.
2. The ray passing through the optical centre passes straight through the lens and remains undeviated.
3. The ray passing through the focal point becomes parallel to the principal axis after refraction by the lens.

(b) If at Anarkali Bazaar Lahore, intensity level of sound is 80 dB, what will be the intensity of sound there? (5)

**Ans** Given data:

Intensity level of Sound = 80 dB

To find:

Intensity of Sound = ?

**Solution:**

Using the formula:

$$\text{Sound level} = 10 \log \frac{I}{I_0} \text{ dB.}$$

Where  $I_0$  = Faintest audible sound =  $10^{-12} \text{ W/m}^2$ .

By putting values, we get

$$80 \text{ dB} = (\log I - \log 10^{-12} \text{ W/m}^2) \text{ dB}$$

$$80 = \log I + 12 \log 10 \text{ Wm}^{-2}$$

$$(8 - 12) \text{ Wm}^{-2} = \log I$$

$$I = 10^{-4} \text{ Wm}^{-2}$$

$$I = 10^{-4} \text{ Wm}^{-2}$$



**Q.6.(a) What is meant by series combination of resistors? Write down its three characteristics. (4)**

**Ans Series Combination:**

In series combination, resistors are connected end to end and electric current has a single path through the circuit. This means that the current passing through each resistor is the same.

**Characteristics:**

1. The total voltage in a series circuit divides among the individual resistors so the sum of the voltage across the resistance of each individual resistor is equal to the total voltage supplied by the source. Thus, we can write as

$$V = V_1 + V_2 + V_3 \quad (i)$$

Where  $V$  is the voltages across the battery, and  $V_1$ ,  $V_2$ ,  $V_3$  are the voltages across resistors  $R_1$ ,  $R_2$  and  $R_3$ , respectively. If  $I$  is the current passing through each resistor, then from Ohm's law

$$\begin{aligned} V &= IR_1 + IR_2 + IR_3 \\ V &= I(R_1 + R_2 + R_3) \end{aligned} \quad (ii)$$

2. We can replace the combination of resistors with a single resistor called the equivalent resistance  $R_e$  such that the same current passes through the circuit. From Ohm's law

$$V = I R_e$$

Thus, the above equation (ii) becomes

$$I R_e = I(R_1 + R_2 + R_3)$$

$$R_e = R_1 + R_2 + R_3$$

Thus, the equivalent resistance of a series combination is equal to the sum of the individual resistances of the combination.

3. If resistances  $R_1$ ,  $R_2$ ,  $R_3$ , .....,  $R_n$  are connected in series, then the equivalent resistance of the combination will be given by



$$R_0 = R_1 + R_2 + R_3 + \dots + R_n$$

- (b) The charge of how many negatively charged particles would be equal to  $100 \mu\text{C}$ . Assume charge on one negative particle is  $1.6 \times 10^{-19} \text{ C}$ . (5)

**Ans** Let charge:

$$q = 100 \mu\text{C}$$

$$q = 100 \times 10^{-6} \text{ C} \quad (\because 1 \mu\text{C} = 10^{-6} \text{ C})$$

Charge on one negative particle is

$$e = 1.6 \times 10^{-19} \text{ C}$$

Quantization rule of charges, we know

$$q = n e$$

$$n = \frac{q}{e}$$

Putting values, we get

$$n = \frac{100 \times 10^{-6}}{1.6 \times 10^{-19}}$$

$$n = 62.5 \times 10^{13}$$

Hence there are  $62.5 \times 10^{13}$  negative particles.

- Q.7.(a)** Draw the circuit diagrams of AND operation and OR operation and also write the truth table of both these operations. (4)

**Ans** The circuit diagram of AND operation is given below:

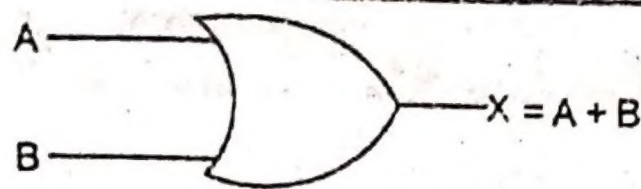


The truth table is given as:

A	B	A.B
0	0	0
0	1	0
1	0	0
1	1	1

The circuit diagram of OR operation is given below:





The truth table is given as:

A	B	$X = A + B$
0	0	0
0	1	1
1	0	1
1	1	1

- (b) Half-life of a radioactive element is 10 minutes. If the initial count rate is 368 counts per minute, find the time by which count rate reaches 23 counts per minute? (5)

**Ans** For Answer see Paper 2019 (Group-I), Q.7.(b).

